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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/825,058	04/03/2001	John E. Hudson	476-2033	1978

23644 7590 12/02/2004

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EXAMINER	
WILLIAMS, LAWRENCE B	
ART UNIT	PAPER NUMBER
2634	

DATE MAILED: 12/02/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/825,058	HUDSON, JOHN E.	
	Examiner	Art Unit	
	Lawrence B Williams	2634	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 April 2001*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-27* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-27* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☒ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *03 April 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. This application has been filed with informal drawings, which are acceptable for examination purposes only. Formal drawings will be required when the application is allowed.

Specification

2. The abstract of the disclosure is objected to. Applicant makes reference to item numbers of multiple figures. Examiner suggests applicant rewrite abstract and reference only one figure.

Correction is required. See MPEP § 608.01(b).

3. The disclosure is objected to because of the following informalities:

a.) Examiner suggests applicant review lines 15-22 of page 3 to insure references to chip counts are correct.

b.) Examiner suggests applicant rewrite lines 7-14 of page 13 for clarification purposes.

c.) Applicant has included a Fig. 7 in the drawing set. Applicant has failed to include Fig. 7 in his Brief Description of The Drawings.

d.) Applicant sites "length of training sequence, s" in line 31 of page 21. Examiner suggests applicant review specification thoroughly to check similar errors such that reference letters coincide with those used in the claims.

e.) Examiner suggests applicant replace "artefact" with "artifact" in line 2 of page

21.

Appropriate correction is required.

4. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

5. Claim 5 is objected to because of the following informalities: Applicant has submitted an incomplete claim 5 in his marked up copy of the claims submitted on 01 July 2004.

6. Claim 7 is objected to because of the following informalities: Examiner suggests applicant replace "matric" with "matrix" in line 8 of the claim.

7. Claim 10 is objected to because of the following informalities: Examiner suggests applicant delete "and" after comprising in line 2 of the claim.

8. Claim 16 is objected to because of the following informalities: Examiner suggests applicant change " y_n " to " s_n "in line 2 of the claim.
Appropriate correction is required.

9. Claim 14 is objected to because of the following informalities: Applicant appears

to have reversed the use of variables " y_n " and " s_n "in lines 8 and 9 of the claim.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claim 5 recites the limitation "the channel impulse response H" in line 4. There is insufficient antecedent basis for this limitation in the claim.

12. Claim 5 recites the limitation "the signal sequence S" in lines 4 and 5. There is insufficient antecedent basis for this limitation in the claim.

13. Claim 5 recites the limitation "the received training sequence Y" in line 6. There is insufficient antecedent basis for this limitation in the claim.

14. Claim 18 recites the limitation "the channel impulse response H" in line 5. There is insufficient antecedent basis for this limitation in the claim.

15. Claim 18 recites the limitation "the training sequence S" in line 5. There is insufficient antecedent basis for this limitation in the claim.

16. Claim 18 recites the limitation "the training sequence S" in line 6. Applicant has used y_n previously to reference the training sequence.

Claim Rejections - 35 USC § 102

17. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

18. Claims 1, 2, 5-6, 8-9, 13-16, 18-19, 23-25, 27 are rejected under 35 U.S.C. 102(b) as being anticipated by Vook et al. (US Patent 6,765,969 B1).

(1) With regard to claim 1, Vook discloses in Figs. 7-11, a method of determining channel impulse responses of a plurality of channels to a communication device, the method comprising: performing transform operations on both a replica of a signal sequence s_n and a received training sequence y_n received by the communication device in at least one burst, the received training sequence being the signal sequence as received through a channel, the transform operations arranged to generate a multiplicity of signal sequence frequency bins and a multiplicity of training sequence bins; performing point-by-point operations between corresponding signal sequence frequency bins and training sequence frequency bins; and concatenating the point-by-point operations associated with the channel to provide a composite frequency response for the channel, the composite frequency response allowing in the time domain, generation of the channel impulse response (col. 11-col. 12).

(2) With regard to claim 2, Vook et al. also discloses separating training sequence bursts emanating from a single element transmitter by one of a cyclic prefix and a blank (zero) carrier (col. 11, lines 1-8).

(3) With regard to claim 5, claim 5 inherits all limitations of claim 1. Furthermore, Vook et al. also discloses the method of claim 1 further comprising using a set of matrix operations on the frequency domain to resolve channels to the communication device from multiple transmitting stations, the matrix operations

providing solvable linear equations for the channel impulse response H and the signal sequence S expressible in a matrix-vector form at each frequency bin in terms of the received training sequence Y (col. 12, lines 7-46; col. 15, line 49-col. 16, line 67).

(4) With regard to claim 6, claim 6 inherits all limitations of claim 5 above. Furthermore, Vook et al. discloses solving the linear equations using a minimum mean square error (MMSE) estimation technique (col. 13, line 50-col. 14, line 65).

(5) With regard to claim 8, claim 8 inherits all limitations of claim 2, above. Furthermore, Vook et al. discloses wherein the number of bursts sent to the communication device from each transmitting unit in communication contact therewith is calculated as a multiplication of: a number of transmitting elements in a transmit array of a transmitting unit; and a number of transmitting units in communication contact with the communication device (col. 9, lines 8-44).

(6) With regard to claim 9, claim 9 inherits all limitations of claim 8, above. Furthermore, Vook et al. also discloses wherein training sequence burst between transmitting units are time-aligned (col. 9, lines 36-43).

(7) With regard to claim 13, claim 13 inherits all limitations of claim 1 above as claim 13 discloses the means for implementing the method of claim 1 which would be inherent in the method of claim 1.

(8) With regard to claim 14, Vook et al. also discloses a method of determining channel impulse responses of a plurality of channels established between a plurality of transmitting elements and a communication device in a communication system, the method comprising: substantially simultaneously transmitting different training bursts from each of the plurality of transmitting elements, each burst having a length at least

as long as a maximum channel duration in the communication system multiplied by a number corresponding to the plurality of transmitting elements; recovering at the communication device a signal sequence yn from the different training bursts sn; and resolving the plurality of channels to recover associated channel impulse responses H for each channel by solving an algebraic matrix operation expressed in matrix-vector form as Y=SH, where: S is a matrix of partial training bursts for each channel, each training burst segmented into N pieces in the time domain; Y is a vector of a received signal sequence; and H is a concatenation of different channel impulse response vectors (col. 11-col. 12; col. 15, line 49 – col. 16, line 67).

(9) With regard to claim 15, Vook et al. also discloses a computer program product for a processor within a receiver device, the computer program product comprising: code that performs transform operations on both a replica of a signal sequence s_n and a received training sequence y_n received by the communication device in at least one burst, the received training sequence yn being the signal sequence as received through a channel, the transform operations arranged to generate a multiplicity of signal sequence frequency bins and a multiplicity of training sequence frequency bins; code that performs point-by-point operations between corresponding signal sequence frequency bins and training sequence frequency bins; and code that concatenates the point-by-point operations associated with the channel to provide a composite frequency response for the channel, the composite frequency response allowing, in the time domain, generation of the channel impulse response for the channel, wherein the codes reside in a computer readable medium (claims 23-26).

(10) With regard to claim 16, Vook et al. also discloses in Fig. 5, a communication device having a receiver (560) coupled, in use, to receive a plurality of channels supporting a signal sequence s_n and training sequence bursts, the communication device having: a signal processing platform to perform transform operations on both a replica of a signal sequence s_n and a received training sequence y_n received by the communication device in at least one burst, the received training sequence y_n being the signal sequence as received through a channel, the transform operations arranged to generate a multiplicity of signal sequence frequency bins and a multiplicity of training sequence bins; the signal processing platform arranged to perform point-by-point operations between corresponding signal sequence frequency bins and training sequence frequency bins; and the signal processing platform further arranged to concatenate the point-by-point operations associated with the channel to provide a composite frequency response for the channel, the composite frequency response allowing in the time domain, generation of the channel impulse response (col. 11- col. 12).

(11) With regard to claim 18, claim 18 inherits all limitations of claim 16. Furthermore, Vook et al. also discloses communications device of claim 16, wherein the signal processing platform operates to establish a set of matrix operations on the frequency domain to resolve channels to the communication device from multiple transmitting stations, the matrix operations providing solvable linear equations for the channel impulse response H and the signal sequence S expressible in a matrix-vector form at each frequency bin in terms of the received training sequence Y (col. 12, lines 7-46; col. 15, line 49-col. 16, line 67).

(12) With regard to claim 19, claim 19 inherits all limitations of claim 18 above. Furthermore, Vook et al. discloses wherein the signal-processing platform solves the linear equations using a minimum mean square error (MMSE) estimation technique (col. 13, line 50-col. 14, line 65).

(13) With regard to claim 23, claim 23 inherits all limitations of claim 14, as claim 23 merely discloses a receiver incorporating means for the method disclosed in claim 14.

(14) With regard to claim 24, claim 24 inherits all limitations of claims 14 and 23 above.

(15) With regard to claim 25, claim 25 inherits all limitations of claim 24. Furthermore, Vook et al. also discloses separating training sequence bursts emanating from a single element transmitter by one of a cyclic prefix and a blank (zero) carrier (col. 11, lines 1-8).

(16) With regard to claim 27, claim 27 inherits all limitations of claim 24, above. Furthermore, Vook et al. discloses wherein the number of bursts sent to the communication device from each base station in communication contact therewith is calculated as a multiplication of: a number of transmitting elements in a transmit array of a transmitting unit; and a number of transmitting units in communication contact with the communication device (col. 9, lines 8-44).

19. Claims 10 and 21 are rejected under 35 U.S.C. 102(b) as being anticipated by Jeon et al. (An Efficient Technique For OFDM Systems with Transmitter Diversity).

(1) With regard to claim 10, Jeon et al. discloses a method of determining channel impulse responses of channels incident to a communication device, the method comprising: and transmitting multiple quasi-orthogonal pseudo-noise sequences as bursts from multiple base stations each having at least one transmit element, successive bursts providing an extended training sequence for use in channel estimation at the communication device; applying a Wiener frequency domain MMSE deconvolution with frequency domain spatial decoupling matrices to generate channel impulse response estimates for the channels (pg(s) 1246-1247).

(2) With regard to claim 21, claim 21 inherits all limitations of claim 10 as claim 21 merely claims a receiver comprising means for the method of claim 10.

Double Patenting

20. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

21. Claims 1-12 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 1-12 of copending Application No. 10/109915. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

22. Claims 14, 15, 16-20, 21-22, 23, 24-27 are provisionally rejected under 35 U.S.C. 101 as claiming the same invention as that of claims 13, 14, 15-19, 20-21, 22, 23-26, respectively of copending Application No. 10/109,915. This is a provisional double patenting rejection since the conflicting claims have not in fact been patented.

Double Patenting

23. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

24. Claim 13 is provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 15 of copending Application No. 10/109,915. Although the conflicting claims are not identical, they are not patentably distinct from each other. The instant application's claim 13 discloses a communication device comprising "means for performing transform operations", "means for performing point-by-point operations", and "means for concatenating"; while claim 15 of co-pending Application No. 10/109,915 discloses a signal processing platform

(means) to perform transform operations, perform point-by-point operations and also to perform concatenating.

This is a provisional obviousness-type double patenting rejection because the conflicting claims have not in fact been patented.

Allowable Subject Matter

25. Claims 3-4, 7, 11-12, 20, 22, 26 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

26. The following is a statement of reasons for the indication of allowable subject matter: the instant application discloses a method and device for determining channel impulse responses of a plurality of channels. Records of prior art disclose similar methods and devices but fail to teach a method "wherein multiple Steiner codes are transmitted as training sequences, the multiple Steiner codes sent from multiple transmit elements in multiple training bursts" as disclosed in claims 3 and 26, nor wherein the MMSE estimation technique employs a Weiner filtering operation providing: as disclosed in claims 7 and 20. Nor does the prior art disclose the method "wherein the quasi-orthogonal pseudo-noise sequences are Steiner codes as disclosed in claims 11 and 22.

Conclusion

27. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a.) Vasic discloses in IEEE Global Telecommunications Conference, Structured Iteratively Decodable Codes Based On Steiner Systems And Their Application In Magnetic Recording.

b.) Li discloses in US Patent 6,654,429 B1 Pilot-Aided Channel Estimation For OFDM In Wireless System.

c.) Buehrer et al. discloses in US Patent 6,515,978 B1 Method and Apparatus For Downlink Diversity in CDMA Using Walsh Codes.

d.) Bar-David et al. discloses in US Patent 5,623,511 Spread Spectrum Code Pulse Position Modulated Receiver Having Delay Spread Compensation.

e.) Westman discloses in US Patent 6,680,967 B1 a Receiver.

f.) Thomas et al. discloses in US Patent 6,141,393 a Method and Device For Channel Estimation, Equalization, and Interference Suppression.

28. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence B Williams whose telephone number is 571-272-3037. The examiner can normally be reached on Monday-Friday (8:00-5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on 571-272-3056. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lawrence B. Williams

lbw
November 24, 2004

AMANDA T. LE
PRIMARY EXAMINER